REMARKS/ARGUMENTS

Claims 1-3 and 34 are pending herein. Claim 34 has been allowed. Claim 1 has been amended hereby to clarify the structural relationship between the claimed ceramic dense body, the ceramic substrate (ceramic porous body) and the electrode layer. Applicants respectfully submit that support for rewritten claim 1 can be found in Figs. 4 and 5, for example, and that no new matter has been added.

Applicants appreciate the PTO indicating that claim 34 is allowed. In addition to allowed claim 34, Applicants respectfully submit that claims 1-3 are also in condition for at least the reasons explained below, and respectfully request that the PTO issue a Notice of Allowance for this application in due course.

Claims 1-3 were rejected under §103(a) over Nishi in view of Tannenberger. Applicants respectfully traverse this rejection.

Independent claim 1 has been amended to clarify the structural relationship between the components of the claimed electrochemical cell. Specifically, claim 1 now recites that the ceramic dense body is directly laminated to contact an entire main surface of the ceramic substrate, and that the electrode layer is directly laminated on the ceramic dense body so that the ceramic dense body contacts an entire main surface of the electrode layer. Applicants respectfully submit, however, that the structural features now recited in rewritten claim 1 are not disclosed or suggested in the applied references for at least the reasons explained below.

The PTO asserted that Nishi's Fig. 44(a) shows a layered solid oxide fuel cell including "an air electrode (15), interconnector (14), fuel electrode (12) and substrate (11)," where the electrolyte layer (e.g., 13 in Nishi's Fig. 44(a)) can be yttrium-stabilized zirconia (YSZ), the fuel electrode 12 can be a NiO/YSZ system material and the air electrode 15 can be a lanthanum manganese system material (see Office Action, page 2, last 5 lines). Applicants respectfully submit, however, that in Nishi's Fig. 44(a), the YSZ electrolyte 13 is <u>not</u> directly laminated to contact an entire main surface of the air electrode 15, and is not directly laminated to contact an entire main

surface of the fuel electrode 12 or the substrate 11. Even if, *arguendo*, the PTO should instead assert that the electrolyte 13 in Nishi's Fig. 44(b) contacts the entire main surface of the air electrode 15, Applicants respectfully submit that the electrolyte 13 still does not contact the entire main surface of the fuel electrode 12 or the substrate 11. As such, the structures in Nishi do not meet each and every claim limitation recited in rewritten claim 1.

In addition to the above-mentioned structural deficiencies in Nishi, the PTO admitted that Nishi does not teach the thickness values or the helium leakage rate recited in the claims. In an attempt to overcome these admitted deficiencies, the Examiner applied Tannenberger, however, Applicants respectfully submit that Tannenberger still cannot overcome the structural deficiencies of Nishi. For example, in the structure shown in Tannenberger's Fig. 1, Applicants respectfully submit that the electrolyte layer 2 (dense body) is not directly laminated to contact the entire main surface of the substrate 1, and the boundary layer 13 is clearly interposed between the electrolyte layer 2 and the substrate 1. Applicants respectfully submit that Tannenberger simply does not disclose or suggest the claimed structure, nor does Tannenberger offer any motivation that would have enabled one skilled in the art to have otherwise provided the claimed cell structure.

Applicants respectfully submit that even if the applied references had been combined in the manner suggested in the Office Action, the resultant electrochemical cell still would not include each and every structural feature recited in rewritten claim 1. Moreover, Applicants respectfully submit that, if the references had been combined, the resultant structure also would have lacked a ceramic dense body having a thickness of less than 25 μm and a laminated sintered body having the claimed helium linkage rate for at least the following reasons.

In the present invention, the claimed electrochemical cell including a laminated sintered body having a low helium leakage rate of 10^{-6}Pa·m^3/s or less is achieved, at least in part, by providing an air-tight ceramic dense body having a thickness of 25 μm or less. On the other hand, in Tannenberger, the thickness of the electrolyte layer is

"optimized" in an effort to achieve sufficient oxygen ion conductivity along with providing sufficient gas-tightness. In connection with this, Applicants respectfully submit that Tannenberger discloses that the residual leakage rate is set to less than 10^{-6}mbar·l/cm·s (see Tannenberger, Col. 4, lines 16-21). Applicants respectfully submit that, in the context of Tannenberger, the oxygen ion conductivity increases/improves as the thickness of the electrolyte layer decreases. However, as the electrolyte layer thickness decreases, so does the gas-tightness of the structure.

In an effort to maintain a balance between these competing factors, Applicants respectfully submit that Tannenberger discloses that the layer thickness should be reduced to "optimize" the oxygen ion conductivity only so far as to not negatively influence the gas-tightness, which remains a consideration. Applicants respectfully submit that one skilled in the art would have understood that concept, based on the disclosure in Tannenberger, and that such skilled artisans seeking to optimize Tannenberger would have kept the need for providing both improved oxygen ion conductivity without sacrificing sufficient gas-tightness in mind during their routine experimentations. That is, it would not have been obvious for one skilled in the art to have continued to further decrease the thickness of the electrolyte layer, below that thickness threshold which is required to provide sufficient gas-tightness, even in order to "optimize" the oxygen ion conductivity of the electrolyte layer so that the layer would have a thickness of 25 μm or less, as claimed. Indeed, providing such a thickness would not have been obvious to one skilled in the art performing any routine experimentation to optimize Tannenberger's structure without also necessarily relying on the present application as a guide, which constitutes impermissible hindsight.

Further, the PTO cited Column 6, lines 19-21 of Tannenberger, which describes that the residual gas leakage rate, measured with helium, is set to be below 10^{-6}mbar·l/cm·s, regardless of the chosen thickness. According to Tannenberger's "EXAMPLE 1," the electrolyte layer 2 is formed by VPS to obtain a leakage rate of 10^{-6}mbar·l/cm·s when the layer thickness is 100 μm (see Tannenberger, Col. 8, lines

40-41, Col. 9, lines 1-11 and the table). Applicants respectfully submit, however, that one skilled in the art would have recognized that the set helium leakage rate of 10^{-6}mbar·1 cm·s in Tannenberger is standardized with respect to a unit area and a unit thickness, in the following manner:

$(10^{-6}\text{mbar}\cdot\text{l/cm}\cdot\text{s}) = (10^{-6}\text{mbar}\cdot 1\cdot\text{cm/cm}^2\cdot\text{s})$,

wherein "mbar" represents a pressure of leaked helium; "l (liter)" represents a volume of leaked helium; "mbar · l" represents a mass of leaked helium; "cm" represents a thickness of a test piece; "cm^2" represents an area of a test piece; and "s (second)" represents a time period for test; so that "10^{-6}mbar·1·cm/cm^2·s" means a mass of leaked helium (mbar · liter) × a thickness of 1cm per an area of 1cm^2 and a time period of 1 second.

In that manner, Applicants respectfully submit that one skilled in the art would recognize that the helium leakage rate in Tannenberger's structure is made constant regardless of the chosen layer thickness, because this rate is already standardized per unit layer thickness:

$10^{-6}\text{mbar}\cdot 1\cdot\text{cm/cm}^2\cdot\text{s} =$

$10^{-6} \times (100\text{Pa}) \times (10^{-3}\text{m}^3)\cdot\text{cm/cm}^2 \cdot \text{s} =$

$10^{-7}\text{Pa}\cdot\text{m}^3\cdot\text{cm/cm}^2 \cdot \text{s}.$

According to Tannenberger, the layer thickness is optimized at 100 μm to both obtain the maximum oxide ion conductivity and to assure the necessary gas-tightness. Applicants respectfully submit that one skilled in the art would not have had any motivation to attempt to reduce the standardized thickness of 100 μm, already optimized for the necessary gas-tightness, all the way down to 25 μm or less and would not have had any reasonable expectation of maintaining the gas-tightness so as to possibly provide a helium leakage rate of 10^{-6} Pa·m ^{3}/s. Again, Applicants respectfully submit that, if anything, hindsight alone, would be the only root for any such motivation. However, such hindsight-based analysis is clearly improper and cannot be used to form the basis of an obviousness rejection under §103(a).

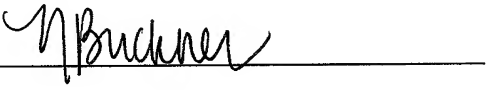
For at least the reasons explained above, Applicants respectfully submit that the applied references simply do not disclose or suggest each and every feature recited in independent claim 1. Accordingly, Applicants respectfully submit that independent claim 1, and all claims depending therefrom, define patentable subject matter over the applied references. Accordingly, Applicants respectfully submit that the above rejection be withdrawn.

If the Examiner believes that contact with Applicants' attorney would be advantageous toward the disposition of this case, the Examiner is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

December 28, 2006
Date



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